DIVISION 15
SECTION 15601

IDENTIFICATION OF AMMONIA REFRIGERATION PIPING AND SYSTEM COMPONENTS

Tyson Foods, Inc.
Tyson Engineering

REVISION STATUS LOG

DATE	REVISION DESCRIPTION	ORIGINATOR	APPROVED ENGINEERING SERVICES	APPROVED PROJECT MANAGEMENT	APPROVED PLANT ENGR./MAINT. MGR.

1.0 GENERAL

1.1 SCOPE

1.1.1 The work covered by this section includes furnishing of all labor, material and equipment necessary ~~to furnish and install~~ refrigeration piping and system components ~~identification~~.

1.1.2 It will be the Contractor's responsibility to coordinate with all other trades for installation of the refrigeration piping and system components identification in a timely fashion throughout the course of the project.

1.1.3 All piping mains, headers and branches shall be identified as to the service, the relative pressure level of the refrigerant and the direction of flow~~;~~.

1.1.4 All components of the refrigeration system, e.g., receivers, heat exchangers, accumulators, etc., shall also be uniformly identified~~;~~.

1.1.5 The identifying designations given to the piping and components that comprise the refrigeration system shall be consistent with the nomenclature used for the Process and Instrument Diagrams being developed under the Tyson Foods, Inc. Process Safety Management Program.

1.2 IDENTIFICATION SYSYTEM

1.2.1 Piping Markers

- The Piping System shall be marked with the identification of content and direction of flow. Pipe line markers shall be placed at change of direction and at approximately 25 foot increments.
- ~~Pipe marking system shall conform to ANSI A13.1-1996 Standards.~~
- ~~Piping markers shall be designed to identify the refrigerant (i.e., ammonia), the relative pressure level of the refrigerant and the direction of flow;~~

1.2.2 The piping marker will be considered to have ~~four~~ (5) sections~~:~~

- Marker body ~~(Service abbreviations)~~
- ~~Pressure level~~ section ~~(Physical State (LIQUID OR VAPOR)~~
- Abbreviation section (Ammonia)
- Pressure Level ~~Designation (High or Low)~~
- Directional arrow

1.2.3 A list of approved abbreviations, which will be used to further identify piping, is provided herein.

1.2.4 Marker Body

- The marker body shall be *SAFETY YELLOW* in color. The word *AMMONIA* shall be printed in *BLACK* letters on the yellow body.
- The size of the marker body and lettering shall be in accordance with these specifications.
- The material requirements for the marker body shall be in accordance with these specifications.

1.2.5 Pressure Level

- The pressure of the refrigerant in the system piping shall be labeled either *HIGH* or *LOW.*
  - Pressure in excess of 70 psig, under normal operating conditions, will be considered to be high pressure. *HIGH PRESSURE* will be denoted by the word *HIGH* and the pressure on that line printed on a *RED* band and applied to the marker body to the right of and adjacent to the word *AMMONIA.*
  - Pressure equal to or less than 70 psig, under normal operating conditions, will be considered to be low pressure. *LOW PRESSURE* will be denoted by the word *LOW* and the pressure on that line printed on a *GREEN* band applied to the marker body to the right of and adjacent to the word *AMMONIA.*

~~1.2.6 The size of the lettering shall be in accordance with these specifications.~~

~~1.2.7 The material used to denote the pressure level on the pipe marker shall be in accordance with these specifications.~~

1.2.8 Ammonia Piping Abbreviations

- Abbreviations shall agree with those shown below. No other abbreviations shall be used.

LINE SERVICE ABBREVIATIONS

BD	BOOSTER DISCHARGE
CD	CONDENSER DRAIN
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
CWR	CONDENSER / COMPRESSOR WATER RETURN
CWS	CONDENSER / COMPRESSOR WATER SUPPLY
DC	DEFROST CONDENSATE
DD	DEFROST DRAIN
EC	ECONOMIZER
EQ	EQUALIZATION
FR	FLOODED RETURN
FS	FLOODED SUPPLY
GR	GLYCOL RETURN
GS	GLYCOL SUPPLY
HGD	HOT GAS ~~DISCHARGE~~
HHTRL	HIGH HIGH TEMPERATURE RECIRCULATED LIQUID
HHTRS	HIGH HIGH TEMPERATURE RECIRCULATED SUCTION
HSD	HIGH ~~SIDE~~ DISCHARGE
HSS	HIGH STAGE SUCTION
HPL	HIGH PRESSURE LIQUID
HTRL	HIGH TEMPERATURE RECIRCULATED LIQUID
HTRS	HIGH TEMPERATURE RECIRCULATED SUCTION
LIC	LIQUID INJECTION COOLING
LLSS	LOW LOW STAGE SUCTION
LLTRL	LOW LOW TEMPERATURE RECIRCULATED LIQUID
LLTRS	LOW LOW TEMPERATURE RECIRCULATED SUCTION

LSS	LOW STAGE SUCTION
LTRL	LOW TEMPERATURE RECIRCULATED LIQUID
LTRS	LOW TEMPERATURE RECIRCULATED SUCTION
MSS	MEDIUM STAGE SUCTION
MTRL	MEDIUM TEMPERATURE RECIRCULATED LIQUID
MTRS	MEDIUM TEMPERATURE RECIRCULATED SUCTION
OD	OIL DRAIN
PO	PUMP OUT
PU	PURGE
RV	RELIEF
SCL	SUB COOLED LIQUID
SOC	SCREW OIL COOLING
TSR	THERMOSYPHON RETURN
TSS	THERMOSYPHON SUPPLY
REFRIG	REFRIGERATION EQUIPMENT
REF-INSTR	REFRIGERATION INSTRUMENTATION

1.2.9 The abbreviation lettering will be in *BLACK* letters on a *SAFETY YELLOW* field.

The abbreviation shall be located to the left of the physical state band.

~~1.2.10 The size of the lettering shall be in accordance with these specifications.~~

~~1.2.11 The material used for the abbreviation section shall be in accordance with these specifications.~~

1.2.12 Pictorial View of a Pipe Marker

A typical marker for a saturated Low Temperature Recirculated Suction (LTRS) line is pictured below:

Abbreviation Section	Physical State	Pressure Level	Directional Arrow
	(LIQ) = Orange (VAP) = Blue	Low (70 psig or less)=Green High (More than 70 psig)=Red	

Marker Body (Black on Safety Yellow)

1.2.13 Identifying Small or Hidden Pipe

- ~~In those instances where one pipe is hidden behind another, or where the pipe outside diameter (O. D.) is too small for a pipe marker to provide proper visibility, an alternate method of marking shall be used.~~

- If the pipe is ½" or less, or if a pipe that is hidden, a properly sized marker should be applied to a durable piece of material, such as Plexiglas or sheet metal, cut to the dimensions of the marker and suspended from the pipe so that the marker is clearly visible. The marker should be suspended using durable, corrosion resistant wire or chain.

1.2.13.1 Pipe Marker Dimensions and Lettering Size

- The size of the pipe marker and the lettering thereon is determined by two factors:
  - The outside diameter of the pipe, including insulation on insulated pipe.
- Considering these factors, the size of the pipe marker and lettering should be selected to provide quick and positive identification. Pipe location, from a viewer's standpoint, will be different on every installation. Therefore, on-site decisions will be necessary to provide the optimum pipe marking system.

1.2.14 Component Markers

1.2.14.1 Component markers will bear the name of the equipment they identify. This will agree with the Process and Instrument Diagrams being developed for the Process Safety Management Program.

- In addition, component markers will be provided with a pressure level designation.

1.2.14.2 Component markers will have *BLACK* letters on a *SAFETY YELLOW* field.

1.2.14.3 Pressure level will be indicated by the word *HIGH* in *RED* letters or the word *LOW* in *GREEN* letters printed or applied flush with the right edge of the marker.

~~1.2.14.4 The material used for component markers shall be in accordance with these specifications.~~

1.2.15 Component Marker Dimensions and Lettering Size

- Component markers will be approximately 3-1/2" wide and long enough to accommodate the name of the component leaving a 2-1/2" margin at either end of the name to allow room for the pressure level designation.
- Lettering on component markers will be 2-1/2" high.
- Pictorial View of a Component Marker

  A typical marker for an Accumulator is pictured below.

COMPONENT (Black on Safety Yellow) PRESSURE LEVEL
Low (70 psig or less) - Green
High (more than 70 psig) - Red

1.3 VALVE TAGS

1.3.1 Valve Designations

GL - Globe Valve

BF - Butterfly Valve
CV - Check Valve
PG - Plug Valve
HE - Hand Expansion Valve
BA - Ball Valve
GT - Gate Valve
EX - Excess Flow Valve
BL - Balancing Valve
SC - Stop Check Valve
NV - Needle Valve
DV - Drain and Vent Valve

1.3.2 Valves ~~to~~ be tagged with appropriate valve designations as shown in the P&ID.

- Valve tags shall be as described in Section 2.0 "Products", paragraph 2.3.
- Valve tags shall be provided for all valves.
- The service designation shall be a minimum ¼ inch high letters placed horizontally.

1.3.3 Information on valve tags shall contain either three or four lines of text depending on the Plant standard configurations. The standard valve tag shall display three lines of numbers and text with the option to have a fourth line that corresponds to the Tyson Foods P&ID number.

~~This shall be in accordance to the following schedule:~~

- Line 1 (Top): Service designation.
- Line 2 (Middle): Normal, or natural position of the valve, i.e., in the case of a solenoid valve; "NO" or "NC".
- Line 3 (Bottom): Valve number.
- Option, line 4 (Bottom): Tyson Foods P&ID number.

1.4 REFERENCE S

- Section 15525, "ID of Piping System and Components"
- ~~ANSI A13.1, "Scheme For Identification of Piping Systems"~~
- ~~ANSI A13.1Standards~~
- ~~DIN 2403, "Identification of Pipelines According to the Fluid Conveyed"~~
- ~~DIN 2405 "Pipelines in Refrigeration Plants - Characterization (Mark, Sign)"~~
- IIAR Bulletin 114, "Guidelines For Identification of Ammonia Refrigeration Piping and System Components"

1.5 SUBMITTALS

1.5.1 Product Data - Submit manufacturer's specifications for fabrication and installation, including data substantiating that products comply with requirements.

1.5.2 Shop Drawings

- Submit shop drawings to the Owner's Project Engineer for approval.

1.6 DEFINITIONS

1.6.1 For purposes of this procedure, the following terms shall have the definitions provided:

- Piping System
  - A piping system includes all ammonia refrigerant piping and fittings, hand valves, control valves and other devices that are mounted in the refrigeration lines.
  - Pipe insulation is also considered part of the piping system.
  - Pipe supports, hangers, brackets or other piping accessories are **not** considered part of the piping system.

- System Components
  - ~~System components include~~ compressors and compressor units, condensers, receivers, thermosyphon vessels, recirculators, intercoolers, accumulators, transfer vessels, heat exchangers, oil pots and any other component of the refrigeration system containing refrigerant that is not included in the piping system.

2.0 PRODUCTS

2.1 GENERAL

2.1.1 Strapping for Strap-on type pipe markers shall be those provided with the marker and approved by the Manufacturer and the Tyson Foods Project Engineer.

2.1.2 Strapping shall be applied following the Manufacturers specifications and details.

2.1.3 Manufacturer's name and model number references herein are to establish quality and design specification. Unauthorized substitutions shall not be permitted.

2.2 MARKER MATERIAL REQUIREMENTS

2.2.1 Pipe markers for ALL projects shall be Marking Services, Inc. (MSI) MSI MS-995 Maxilar Polyester/Tedlar™ strap-on type pipe markers. *MSI can be reached at: Phone, (414) 973-1331, or Fax, (414) 973-1332*

2.2.2 All pipe markers to be installed indoors and outdoors shall be Marking Services, Inc.(MSI) MS-995 Maxilar polyester/Tedlar™ strap-on type pipe markers. MSI MS-995 strap-on pipe markers shall be used in all application of piping from ½" and greater in outside diameter including insulation. Strap-on type markers shall be installed according to manufacturer's specification and details, strapping for strap-on type shall be those as available from MSI or approved by the project engineer.

2.2.3 Piping OD ¾" thru 1-7/8"

Pipe label for this pipe size range shall be MS-995 style AMA. Style AMA marker consists of 1"x12" label mechanically applied to a 1.5"x14.5" carrier. MS-995 Style AMA ammonia refrigeration pipe labels are to be installed with two 10" fixed length stainless steel strap, one band at each end.

2.2.4 Piping 2" thru 7-7/8"

Pipe label for this pipe size range shall be MS-995 style AMF. There are a total of 8 pre-stamped holes in this style strap-on label to allow installation on a wide range of pipe sizes. MS-995 style AMF pipe labels consist of a 2.25"x16" label mechanically applied to a carrier. MS-995 Style AMF ammonia refrigeration pipe labels are to be installed with 35" fixed length stainless steel strap, one band at each end.

2.2.5 Piping 8" & Greater

Pipe label for this size range shall be MS-995 style AM. MS-995 Style AM pipe labels consist of a 4.5"x33" label mechanically applied to a carrier. All MS-995 Style AM ammonia refrigeration pipe labels are to be installed with use of stainless steel banding appropriate for outside diameter of piping including insulation, one band at each end.

Physical & Chemical Characteristics

Material:	0.080” (2.03mm) thick high molecular weight polyethylene
Service Temperature Range:	- 40°F to 225°F (-40°C to 107°C)
Water Resistance:	Excellent
Outdoor Durability:	Minimum 5 Years
UV Resistance:	Excellent; 2% carbon-filled
Density:	1.13 gm/cm^3; talc-filled
Chemical Resistance:	Excellent
Storage Stability:	Indefinite when stored at room temperature with moderate humidity

MS-995 Label Physical & Chemical Characteristics

Materials:	0.0032” (0.081mm) thick PVC and 0.002” (0.051mm) Tedlar® top layer
Adhesive:	permanent pressure-sensitive acrylic
Application Temperature:	50°F (10°C) minimum
Service Temperature Range:	- 40°F to 180°F (-40°C to 82°C)
Water Resistance:	Excellent
Outdoor Durability	5 years minimum
Storage Stability:	5 years minimum
Chemical Resistance:	Excellent

Ammonia Pipe Labels

Part #/Style	Application
995AMA	For piping ¾” thru 1-7/8”
995AMF	For piping 2” thru 7-7/8”
995AM	For piping 8” and greater

*When ordering MS-995 strap-on pipe labels, all that is needed is the Part# or Style by pipe outside diameter including insulation, the service abbreviation (Ex. HTRS) and the quantity of labels. We can determine the rest and contact if there are any questions regarding the physical state and pressure level of the service.

Stainless steel strapping and tool

Part #	Description & Application
15704	10” Fixed length SS strap for use with markers being installed on piping ¾” thru 1-7/8”
15710	35” Fixed length SS strap for use with markers being installed on piping 2” thru 10”
15711	47” Fixed length SS strap for use with markers being installed on piping 10” thru 14”
15712	60” Fixed length SS strap for use with markers being installed on piping 14” thru 16”
15715	Fixed length strapping tool

2.2.6 Strapping for Strap-on type pipe markers shall be those provided with the marker and approved by the Manufacturer and the Tyson Project Engineer.

2.2.7 Strapping shall be applied following the Manufacturers specifications and details.

2.3 VALVE TAGS MATERIALS

2.3.1 The Tyson Foods standard valve tags are manufactured by Marking Services Incorporated (MSI).

- ~~MSI can be reached at: Phone, (414) 973-1331, or Fax, (414) 973-1332.~~
- The Tyson Foods Plant Engineer and/or Project Engineer shall select one or more of the following valve tag options:
- Two inch (2”) round stainless steel laser-engraved with black lettering. The Tyson Foods part number for this option is LB501001.
- Two inch (2”) square MAX-TEK™ rigid lexan with yellow background and black lettering on one side. The Tyson Foods part number for this option is LB501002.
- Two inch (2”) square MAX-TEK™ flexible lexan with yellow background and black lettering on both sides. The Tyson Foods part number for this option is LB501003.
- Quality Control recommends using the stainless steel tags in production areas or where there is open product. Any tag option may be used in other locations.
- Tags shall be made of 20-gauge stainless steel or Lexan material (thickness based on choice of tag), 2-inch round or 2-inch square.
- Valve tags shall be attached to valve bonnets with a stainless steel wire rope, jack chain or seal.
- Valve tags for the Danfoss and Hansen valve assemblies shall be as follows:

The Danfoss ICF valve assemblies (6 port and 4 port) valve tags. For Hansen MVP valve assemblies 4 port valve tag with an appropriate caption shall be used.

2.3.2 Valve Tag Fasteners

- Options for valve tag fasteners are as follows:
  - 1/16” stainless steel rope, with stainless steel or aluminum compression sleeves (McMaster-Carr).
  - Stainless steel meter seals from Marking Services Incorporated (MSI).
  - Stainless steel jack chain from Marking Services Incorporated (MSI).

3.0 EXECUTION

3.1 GENERAL NOTES

3.1.1 ~~Personnel~~ responsible for marker installation shall be trained and follow ~~manufacturer’s~~ installation instructions and details.

3.1.2 Signs, tags and labels to be installed shall ~~be accompanied by specific instructions for the required installation method~~.

3.1.3 The area supervisor shall be notified of labeling work to take place prior to installation of the signs or labels.

3.1.4 When installing signs and labels, be aware of the surrounding environment. Tyson safety rules and regulations must be followed at all times.

3.1.5 To maintain consistency and prevent potential conflict of information, remove old or outdated signs and labels before installing new.

3.1.6 When labeling equipment, valves or pipes, etc. Determine the normal access route to the equipment and install the tag or label in the most conspicuous position to provide immediate recognition of the equipment.

3.1.7 Do not install a sign or label on or near equipment in a location that would impede the operation of that, or any other equipment.

3.1.8 Fasten signs or labels so that passing personnel will not break them away.

3.1.9 Do not leave sharp ends of strapping exposed that may cause injury to the installer or other personnel.

3.1.10 The Contractor or personnel installing labels are responsible for housekeeping and clean up. All debris and waste shall be removed and properly disposed of, off site, or as required, on a daily basis.

3.2 PIPE MARKER LOCATION

Pipe markers shall be located and oriented so that they are on the normal line of vision and are clearly legible from normal access points. Also, piping markers shall be located as follows:

3.2.1 Equipment: One marker at each entry and exit point from major equipment: pumps, exchangers, filters and vessels included; pump suction and discharge lines are labeled at the

pump (both lines are labeled for paired pumps, then again after union of pump discharge lines).

3.2.2 Manifolds: All lines entering and exiting manifolds shall be labeled with markers visible from a position accessible to turn valves.

3.2.3 Utility Stations: All lines at utility stations shall be labeled once immediately adjacent to hook-ups.

3.2.4 Control Valves: Once on the downstream pipe adjacent to the valve. Vertical lines to/from control valves shall also each be labeled.

3.2.5 Solid Wall/Floor/Ceiling Penetrations: Once on each side of all solid wall penetrations, within 5 feet of penetration.

3.2.6 Vertical piping: Once on vertical pass-thru piping on each level of multi-level structures placed at eye level.

3.2.7 Branches from pipe racks: Branches are labeled at the connection, and every 40 linear feet thereafter until connection with equipment.

3.2.8 When more than one of the above criteria described above occurs on the same pipe in a general area (within 15 feet) then a single marker will suffice to identify the pipe.

3.2.9 Pipe Racks: Rack piping shall be labeled at approximately 40 foot intervals, and within 20 feet of major pipe rack intersections; each pipe in a rack or pipe chase will be labeled at the same location (cross-section). This provides a uniform appearance and consistent visibility for all connecting pipe.

3.2.10 Before and after a change in piping direction.

3.2.11 At least once on the piping in every area through which refrigeration piping passes.

3.2.12 Exterior and interior straight pipe runs shall be identified where they cross roads, walkways or other traffic routes.

3.2.13 Multiple Pipes in the same general area shall be marked in the same general location (whenever possible) in order to distinguish one piping system from another.

3.3 VISIBILITY

Care should be taken in placing the marker on the pipe to provide good visibility. Where piping is located above or below the normal line of vision, the lettering shall be placed above or below the centerline of the pipe, respectively.

3.4 APPLICATION STEPS

3.4.1 Strap-on markers (Marking Services, Inc. MS-995 Maxilar Pipe Markers):

3.4.1.1 Place marker on pipe to be labeled (No cleaning of pipe is necessary).
3.4.1.2 Rotate marker to provide for the best legend visibility from the floor.
3.4.1.3 Install S.S. strap required for application and use strap on tool to pull tightly and align

3.4.2 **Tank/Vessel Signs:** Large tanks and vessels shall be marked at all access points and at all levels. This will aid emergency responders in determining contents of vessels.

3.5 VALVE TAG INSTALLATION

3.5.1 Valve tags shall be installed in the most conspicuous position and in line from normal access routes to provide immediate recognition on approach to the valve.

3.5.2 Install valve tags on valve yoke or body only.

3.5.3 Do not install valve tag on valve hand wheel.

3.5.4 Do not install valve tag on valve packing gland nuts or valve stem.

3.5.5 On small valves, install the valve tag on the valve body below the packing nut. Secure the tag tight enough that it will not slide beyond the valve-packing nut or the valve handle.

3.5.6 Do not leave any cable ends exposed or sharp ends on meter seals or strapping.

3.5.7 Attach the valve tag so that it is left level and plumb.

3.6 REFERENCE CHART

3.6.1 A reference chart that fully explains the ammonia refrigeration piping and component identification markers, including the approved abbreviations, shall be placed in areas that are conspicuous to operating personnel.

3.6.2 The reference chart shall be made of durable material that will remain legible. Use – MSI MS-215 MAX-TEK Lexan signs. MSI Part number for these signs are 65547.

3.7 SAFETY

3.7.1 This specification and related information shall be filed as part of Process Safety Information of PSM Program, Subsection Material of Construction.

3.8 CLEANING

3.8.1 Upon completion of the installation, all exposed surfaces shall be thoroughly cleaned and touched up as recommended by the manufacturer.

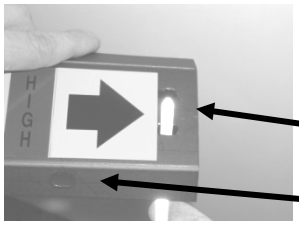
3.8.2 Remove all trash and debris from installations from jobsite daily.

3.9 Expanding the identification System

The above are the minimum requirements for pipe, tank, vessel and component markings. Additional information pertinent to a particular application, e.g., operating temperature, pressure levels, toxicity, flammability, etc., that would be of value to the operator, may be incorporated into the identification system.

Any augmentation of the system shall be done in a manner that does not circumvent the intent or quality of the system. The addition of other useful information to the identification system is encouraged, as long as the addition is done in the spirit of this ~~publication,~~ and meets all applicable codes and regulations.

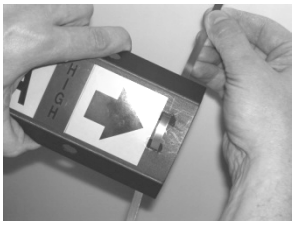
Marking Services, Inc.
MS-995 STRAP-ON AMMONIA PIPE LABEL INSTALLATION GUIDE
For Tyson Foods, Inc.



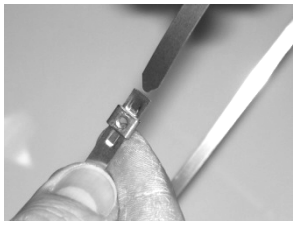
For style AMF, use the side slots for pipe sizes 2” thru 4-7/8”

For style AMF, use the top & bottom slots for pipe sizes 5” thru 8”

Slide strap through the slots in plastic carrier. For Style AMF select appropriate pair of slots based on the outside diameter of the pipe including insulation.

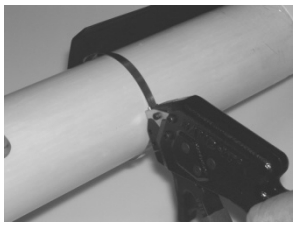


Pull strap through each side to desired length.



Determine appropriate location for pipe label to be installed. Hold pipe label against the pipe and slide the pointed end of strap through the slotted end of strap on both ends of the pipe label.

Feed pointed end of the strap through the banding tool. Squeeze banding tool handle to feed excess strap through.



When strap begins to tension, check location of pipe label on the line to ensure appropriate location. Continue to squeeze handle until the banding snaps. Repeat on the other side.

Ensure carrier is snug on pipe and visible from applicable side or bottom.

*Any questions or need for additional explanation may be directed to Marking Services Inc. Tel#1-800-234-0135

DOCUMENT STANDARD REVISIONS

Rev.#	Description of Change	Approved By	Changed By	Date
0	Initial Generation of Document			
1	Added valve tags for the ICF and MVP valve assemblies	Chad Merchant	Yevgeniy Kovtunov	05/24/12
2	Dates removed for reference codes and documents	Tyson Engineering	Mike Chapman	06/29/13